ANÆSTHESIA IN WAR CIRCUMSTANCES*

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Iuppiter illa piæ secrevit litora genti,
Ut inquinavit ære tempus aureum;
Ære, dehinc ferro duravit sæcula, quorum
Piis secunda vate me datur fuga.†
Horace, Epode XVI, 63.

LIKE events to those which occasioned the Peloponnesian War, though varying in force and form with every new combination of circumstances, are bound to occur as long as the nature of man continues the same. Such was the fateful prophesy of the first historian, Thucydides, many, many years before the antithetical vaticination of Horace nineteen hundred and seventy years ago. Still Utopian, as in William Morris' *News from Nowhere,* the Golden Age has not been realized; yet we must unswervingly continue more collectively to achieve the perfect state, where shall reign Isaiah's Prince of Peace, despite the seemingly ineludible doom foreshadowed by the Thracian chronicler. Erasmus, in his *Querela Pacis,* has Peace complaining that mortals, in driving her away from them, remove the source of all human blessings, and let in a deluge of calamities on themselves, the unutterable miseries of war. It may be that when this most wicked of Iron Ages has spent itself, peace will be made permanent. In the meantime, however, we must meet the vicissitudes of the hour. Notable among these are the problems of pain, comprehensively to be considered under anæsthesia.

While it is evident that the general principles of anæsthesia are not affected by the circumstances of war, it is equally evident that it is our duty assiduously to seek those means in anæsthesia which are especially suited to the exigencies of battle; and I hope to show that although men of the fighting services are of necessity exceptionally fit before an engagement, they may frequently be most urgently in need of the best attention known to anæsthesia after the conflict. While our subject cannot be exhausted in a few minutes, it may be treated briefly, and sufficiently for the occasion, as we consider the circumstances variously obtaining before, during, and after anæsthesia; always mindful of the axiom that whatever is done should suit the general condition as well as the surgical requirements of a given individual.

Slight injuries.—Wherein there is little or no shock, the subject of lesser lesions will have received, promptly for his pain, an opiate, with which it is well to give scopolamine to enhance its action, dispel fear and cause amnesia. If much more than an hour elapses before the start of anæsthesia, these drugs may be administered again. And now, the choice of the anæsthetic is from among those of "local" and "general" procedures. Usually, in this class of case, in which muscular relaxation is not particularly required, it will suffice to use local infiltrations or "nerve-block" injections of drugs like procaine; inhalations of nitrous oxide, cyclopropane, vinyl ether or ethyl ether; or, intravenous administrations of one of the shorter-acting barbiturates, such as pentothal. The selection will be influenced by the number of cases to be done, the number of anæsthetists, and the extent of the surgical facilities. The time factor may be important.

Severe injuries.—Casualties manifesting shock are to be handled with the greatest circumspection and with the least possible surgical intervention until the state of the blood circulation is restored. Any such case must be actively treated for shock until he has recovered fairly well from the early physical condition of depression, before an operation is attempted. During the interval, to conserve energy one may give small doses of opiates, such as morphine and scopolamine with vigilance in regard to respiratory depression; one gives supporting intravenous fluids, until the pulse rate decreases and the blood pressure goes up considerably; and one applies heat for the restoration of body temperature. So soon as these circumstances have been rendered relatively stable as evidenced from frequent observations on the character of the breathing, the rate of the pulse and the degree of the blood pressure; so soon as these three seem to be on a satisfactory scale in rela-

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† "Jupiter set apart these shores for a righteous folk, ever since with bronze he dimmed the lustre of the Golden Age. With bronze and then with iron did he harden the ages, from which a happy escape is offered to the righteous, if my prophesy be heeded."

tion to one another, the patient may be considered ready for operation.

The question of anæsthesia now presents itself, and at once it may be said that, with an adequate personnel in a well equipped unit, it is not difficult to decide on what anæsthetic drugs to use and what procedures to employ. Thinking of choice like this, I am minded of the remarks of Albert Guérard, Professor of Literature of Stanford University, that "a school is 'consolidated advertising', a pressure group. . . . But the schools also foster elements which are inimical to art as well as to good manners: dogmatism (every school has discovered 'the only possible method'); superciliousness ('We have done with the old fogeys'); cliqueishness ('No one shall have wit, but ourselves and our friends'). A school imposes—a false consistency." So in anæsthesia, let us select impartially, although carefully, from among the drugs at our disposal as well as from the methods of their administration, with a view to their appropriateness to the conditions of the man about to undergo an operation. Emerson has said that "a foolish consistency is the hobgoblin of little minds". In pre-operative medication, it is customary to use one or more of the sedatives; morphine, dilaudid, a barbiturate such as nembutal or pentothal, avertin, and scopolamine or atropine. Usually, it matters little how these are combined, only one tries to give just enough to produce the desired effects, that is, completely to obnubilate the mental faculties, and so lessen the shock which comes of fear; effectively to inhibit secretions, and so avoid respiratory obstruction; considerably to reduce the amount of general anæsthetic which may be used; and, commendably, to cause the induction of anæsthesia to be much easier.

Looking at the matter in another way, one tries to give just enough of these drugs to produce the desired effects without too much interference with the respiratory movements, too much depression of the circulation, without disturbances to the oxidation-reduction systems. Lest we forget, those braves who come to us, as Homer said, "from out the slaughter, blood, and battle-din", from fighting for us in the "fire, and water, and earth, and lofty ether unbounded", in the words of the pre-Socratic philosopher, Empedocles; these brave ones are none the less subject to emotional impression, none the less susceptible, perhaps inconsciently, to fear, to anxiety, to apprehension. Sedatives soon succeed in quelling such storms of feeling.

For cases of severe injuries, the selection of anæsthetics and of the methods of their administration is done from those belonging to the greater groupings of anæsthesia, namely: regional anæsthesia, that is, local or spinal; and general anæsthesia, whether inhalation or intravenous. I shall consider the anæsthetic materials jointly, with means of their administration, and try to show their suitabilities to the surgical procedures on patients suffering from this type of lesion.

Regional. — Procaine, metycaine, nupercaine, and pontocaine are the drugs just now in favour for producing regional anæsthesia. Virtually, they cause little, if any, impediment in the vital processes. Their employment should, therefore, be encouraged. And although, in execution, local infiltration, field block, the different forms of nerve block, and spinal anæsthesia are found by a large number of surgeons to be tedious and time-consuming; yet as these have become in many instances part of the duties of the anæsthetist—the instances are increasing—in consequence, not only is the surgeon freed of the bother but, through increased individual experience, the dangers have become almost negligible.

So long as preliminary sedation has been made complete, the local and block types of anæsthesia may be considered almost ideal for operations on the head, neck and extremities; and even in the abdomen as well as the thorax, on those rare occasions when spinal anæsthesia may not be carried out on account of the inadvisability of moving the patient. The advantages of spinal anæsthesia are very great, especially on account of the muscular relaxation and the excellent recovery. Digby Leigh and I[5] have shown that, with the exception of blood dilution, the many changes which are apt to take place from general anæsthesia do not appear in spinal anæsthesia. Let it be remembered that some of these changes in metabolism may seriously impede the course of recovery in the patient who suffers some extensive debilitating lesion.[1]

At present I favour the use of percaine for spinal anæsthesia as it lasts longer than any other of its kind, and the Etherington-Wilson technique for its administration[2, 3] as with the sitting posture much less of the drug is required. Someone will object to the sitting-up of a morphinized patient, but it has been found that blood pressure and pulse rate change very little.

It would seem that spinal anæsthesia is only contraindicated wherein the fall in blood pressure, which it frequently causes, is to be feared, as in cases of marked hypertension and advanced cardiovascular disease. Such are not likely to be met among war casualties from the personnel of the fighting forces, but they are being met among those from civil life in the present conflict. As intimated before, there will be much less fall in blood pressure if relatively large quantities of depressant drugs have been given prior to the production of all forms of regional anæsthesia so thoroughly to subdue the cerebral cortex as utterly to bemuddle its organs of thought.

General. — Being a little uneasy lest the devotees of inhalation anæsthesia say that I have over indulged spinal and the like, let me hasten, not to recant, but to say enough so that they may not think me guilty of apostasy. It should be evident that the intravenous method is not advisable for other circumstances than those of minor surgery; for war conditions, the giving of such a drug as pentothal intravenously for an operation of more than twenty minutes, or to administer it fractionally, might well be objected to on the ground of too much detail.

With regard to inhalation anæsthesia, although ether still has a definite place in surgery, although it may be used with relative ease and safety by those who are not too well experienced, and although, when better equipment is not at hand, it is quite permissible to give ether by the "open drop" method; yet nowadays all surgical centres will have an adequate number of anæsthetic machines from which nitrous oxide, cyclopropane or ether may be administered alone or with one another. The high accomplishments of inhalation anæsthesia of late years are the employment of cyclopropane,[9] the absorption of carbon dioxide,[7] and the closed intratracheal technique.[8] The advantages of cyclopropane are already too well known for me to be prolix in the matter, but it may be said that there are two splendid combinations: one of avertin by rectum with cyclopropane, following, by inhalation, the other of pentothal by vein,[4] with cyclopropane by inhalation immediately after. In each instance a smaller-than-usual dose of the first drug is given, the production of full anæsthesia by cyclopropane is done much more easily than ordinarily, and there would seem to be perhaps some salutary synergistic action. In busy periods, however, the giving of avertin takes too much time. The removal of carbon dioxide from the expired air permits in the same case the continued and repeated use of the anæsthetic materials. The closed intratracheal method precludes respiratory obstruction; obviates interference with some surgical procedures, such as in operations about the head, neck and chest; gives absolute assurance of a plentiful supply of oxygen directly to the lungs; affords quieter breathing and a softer abdomen, although narcosis is not profound; and supplies the ready application of Guedel's method of artificial respiration.

So much then for a cursory account of the circumstances prevailing before anæsthesia essential to the treatment of injuries during war. It may serve to indicate the extent of our selection. Neglecting for the nonce the lesser ailments, let us follow a little the course of anæsthesia during operation for a major lesion. Having, in a given individual, chosen the drugs and the methods of their administration, and having produced the required degree of narcosis, it becomes the duty of the anæsthetist carefully to manage its progress. Here let me say that there is no reason why the quality of anæsthesia as well as the ability of the anæsthetists should not be just as high and as great for surgical units of war time as they may be under any other circumstances. The best is none too good for those who fight for us. Before the operation is started the intravenous administration of fluids ought to be begun and continued throughout at a rate suitable to the state of the blood pressure and character of the pulse. Of the clear solutions, glucose should be used in the regional cases, and saline only should be given to the cases of general anæsthesia for the simple reason that in these there is invariably a hyperglycæmia at the time. Either may be replaced by blood or plasma very readily.

To this fluid stream may be added without delay either analeptic and resuscitating or sedative drugs momentarily. Restlessness, which occasionally occurs during regional anæsthesia, can be controlled promptly by the injection of a morphine solution into the intravenous tube. Analeptics, too, may be given in this way. Concerning these, I am firmly of the opinion that they should not be used routinely nor in anticipation of shock. They tend to stimulate the central nervous system and to reverse the effects of sedatives, for example, in spinal anæsthesia, when morphine and scopolamine have been given especially to produce their desired actions, I have

found that these beneficial effects will be definitely minimized by the administration of a mixture of ephedrine and posterior pituitary extract. Why wantonly undo that which was deliberately done with good reason? It has been shown that analeptics are not needed in spinal anæsthesia by the Etherington-Wilson technique, even in upper chest surgery, in about 60 per cent of cases.[2] A most remarkable synergistic effect takes place when posterior pituitary (pitressin) is given along with ephedrine.[6] The one supplements and enormously enhances the power of the other, the result being more effective than larger individual quantities of these drugs in restoring blood pressure and respiration and in abolishing general collapse.

Usually, when it is deemed advisable to use these materials, their hypodermic administration will suffice. The intravenous avenue is not recommended unless the patient is very far gone. This form of stimulation is seldom needed in general anæsthesia, indeed, with cyclopropane it is contraindicated. When modern machines are used a liberal supply of oxygen is assured during inhalation anæsthesia, but in the spinal procedure one is well advised regularly and actively to administer oxygen on account of the depressed breathing, the sluggish circulation, and the dilution of the blood; in other words, on account of the impoverished respiratory exchange and the reduced oxygen carrying power of the blood.

The immediate after-care of a patient just operated upon is not only extremely important but supremely so to the anæsthetist. It becomes him to have a hand in the matter, for by how much the more the possibilities are considered, by so much the more will sequelæ be checked at their source or, at least, be caught in incipience. After operation for a severe injury the patient should be moved with the greatest gentleness, particularly in regard to the horizontal plane, and any desired change in position ought to be made very gradually. This significance concerns the circulation chiefly. Intravenous supporting fluids are to be given as frequently as indicated and to these may be added analeptic drugs, or pain relieving drugs as required. Oxygen therapy should be kept up as long as respiration and circulation are depressed, this implies that the upper respiratory passages must be perfectly patent and that the gas be made moist. To lessen the likelihood of postoperative pulmonary complications, there should be some change made in the patient's position every hour, he should be encouraged to breathe forcefully every hour, and carbon dioxide may be added to the oxygen occasionally. In order that invaluable information be not lost, and for the sake of uniformity, each surgical unit should be obliged from headquarters to keep records of each case, along standard lines, of all that specially pertains to anæsthesia.

Although I have given a rather discursive account of the course which anæsthesia may take under conditions of war, yet it is in good earnest, and such is my appeal to those who are called to be anæsthetists in an ancillary corps of the fighting forces that, in closing I would offer an instance, or two for emulation and of warning: George Saintsbury has said that Boswell "had so steeped himself in his hero that he at last thought and saw all things in Johnson; . . . this omnipresence of the subject in its quiddity". Irving Babbitt in *The New Laokoon* declares that,—"Any one who thinks he has got the Truth finally tucked away in a set of formulæ, is merely suffering, whether he call himself theologian, or scientist, or philosopher, from what may be termed the error of intellectualism or the metaphysical illusion. . . . He should therefore have formulæ and categories, but hold them fluidly; in other words, he must have standards, but they must be flexible; he must have faith in law, but it must be a vital faith."

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RÉSUMÉ

Le mode d'anesthésie doit être adapté au sujet qui doit être endormi ou analgésié. Dans les blessures légères, le choix de l'agent anesthésique ou analgésique est assez vaste. Dans les blessures graves, on doit attendre que la période de choc soit passée et assurer la reprise d'une température, d'une tension artérielle et d'un pouls normaux. La médication pré-opératoire consistera dans les sédatifs usuels: opiacés, barbituriques, etc. L'anesthésie proprement dite sera régionale ou générale selon les cas. L'anesthésie régionale sera faite à la procaine, à la métycaine, à la nupercaine ou à la pontocaine, au choix. L'anesthésie du type

local, ou de blocage, est idéale pour les opérations sur la tête, le cou et les extrémités, et dans certains cas, sur le thorax et l'abdomen. On ne saurait trop louer la rachianesthésie à la percaine: celle-ci n'est contre-indiquée que dans les cas où l'on redoute une chute importante de la T.A. Quant à l'anesthésie générale, la méthode intraveineuse sera réservée aux opérations courtes et mineures. L'éther est toujours recommandable, mais nous avons mieux avec le protoxyde d'azote et le cyclopropane en circuit fermé. On peut combiner l'avertin au cyclopropane et le pentothal au cyclopropane et ainsi diminuer la dose des deux agents. Il faut administrer pendant toute opération majeure du sérum glucosé (anesthésie régionale) ou du sérum salé (anesthésie générale). Parfois, il est utile d'injecter l'association pitressine-éphédrine pour remonter la T.A. ou régulariser la respiration.

La vigilance post-opératoire est essentielle. Alors peuvent intervenir les analeptiques, l'oxygène et les changements de position donnés au malade, etc. Un dossier d'anesthésie doit être exigé. JEAN SAUCIER

INTESTINAL DECOMPRESSION*

(COLLECTIVE REVIEW)

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"DECOMPRESSION in the treatment of intestinal obstruction is the greatest single technical contribution to abdominal surgery of the past ten years".[1] Although this statement from a recent editorial has been repeatedly amplified in the literature with reports of many cases of simple intestinal obstruction treated by suction drainage through an indwelling intestinal tube, yet there still seems to be considerable confusion.

A full recognition of the essential value of reducing the intraluminal tension depends upon an appreciation of the changing emphasis in the relative importance of the possible causes of death in simple intestinal obstruction. Consequently, in attempting to present the rational basis for this treatment it is necessary to summarize briefly the experimental evidence for the actual lethal factor.

The subject must first be classified into (*a*) simple, and (*b*) strangulated cases. The simple obstructions include mechanical occlusions of the lumen and the ones in which reduced peristalsis is the most prominent early factor, that is, the so-called paralytic ileus.

In strangulated cases, of course, the cause of death is the loss of viability, necrosis with resulting increased permeability, ulceration, perforation and peritonitis. In the simple ones, if the pressure in the lumen is allowed to become great enough to interfere with the blood supply of a segment, the same process takes place. But if the blood supply has not been interfered with, then the cause of death in simple obstruction is something very different.

Toxæmia.—Until fifteen or twenty years ago toxæmia was almost universally thought to be the lethal factor. The only question was as to which was the specific poison absorbed from the involved segment of intestine. But since that time much evidence has accumulated to show that there is a definite decrease rather than an increase in the permeability of the wall. Wangensteen[2] has shown a complete loss of absorption from the obstructed segment until the intraluminal pressure has increased sufficiently to interfere with viability and cause actual necrosis. The toxæmia theory would seem to be upset by this fact.

Fluid and salt loss.—In simple obstruction there is, however, a definite increase[3] in secretion from the involved segment. Consequently, with the idea of increased permeability disproved, during the 1920's the focus of attention was shifted from absorption of specific toxic substances to the excess secretion with the resulting loss of fluids and electrolytes.

Experiments during that period showed marked benefit from intravenous replacement of these losses. At that time the chief discussion was on the relative importance of the water, the sodium and the chloride losses,[4, 5, 6, 7] trying to determine which of these three was the primary factor causing death. However, one curious contradiction remained.

As we all know, the higher the obstruction the earlier the death, but with salt and water replacements it was soon shown that life could be prolonged in high obstruction but not in low small bowel obstruction. That is, in high obstruction the salt and water loss due to excessive intestinal secretion and vomiting seemed to be the all important factor, but not so in lower ileal obstructions.

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